

# Bionic reconstruction – restoration at the psychological interface

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Bionic reconstruction – restoration at the psychological interface. Credit: MedUni Vienna/Houdek

Bionic reconstruction, whereby a patient's lifeless hand is replaced by a mechatronic hand, restores hope following accidents. However, not everyone is suitable for this programme – certain psychological preconditions must be fulfilled. The research team headed by surgeon Oskar Aszmann from MedUni Vienna's Department of Surgery has now, for the first time, published the Viennese concept for a structured psychological assessment to determine whether a patient is psychologically suitable for bionic hand reconstruction.

Accidents can cause serious injuries to the nerves that supply the arm and hand. If the function of these nerves is not restored within a few months of the accident, the hand musculature "dies", so that the hand becomes a non-functional appendage with no sensation. [Bionic reconstruction](#), in which the lifeless hand is replaced by a mechatronic hand, restores hope to these patients. However, not everyone is suitable for this programme – certain psychological preconditions must be fulfilled.

Young motorcyclists, in particular, often suffer nerve root avulsion injuries. Their arms are flung away from their bodies with great force and the considerable tensile strain causes individual nerve roots to tear away from the spinal cord. The brain – spinal cord – nerve pathway is interrupted, so that patients can no longer feel or move their hand.

In most cases it is possible, through timely nerve reconstruction, to restore some function in the shoulder and elbow. However, in most cases the muscles in the hand do not survive this period without a nerve supply. Oskar Aszmann presented the concept of bionic reconstruction for such patients at the Medical University of Vienna in 2015. The procedure involves grafting new muscles into the forearm, so that these can then act a signal amplifier for the remaining nerves. The non-functional hand is then replaced by a mechatronic hand. Even after years without any manual function, patients with this type of prosthetic hand

are again able to exert a strong grip and to manipulate objects.

However, bionic reconstruction involves amputating the non-functional hand, which constitutes a serious breach of physical integrity. It is therefore essential to ascertain in advance whether a patient is aware of the ramifications of this decision and understands the amount of rehabilitation required to restore manual function, albeit mechatronic. Laura Hruby and Anna Pittermann, both from Aszmann's team, have therefore developed a psychosocial assessment procedure that every patient must undergo before the elective amputation.

The assessment consists of several questionnaires and a two-hour interview with experienced clinical psychologist Anna Pittermann. The process aims to ascertain to what extent potential candidates have come to terms with the accident that caused the [nerve](#) injury, what expectations they have of a prosthesis and whether these expectations are realistic.

"Again and again, we encounter patients who have cyborg-type fantasies, which are primarily driven by distorted reports in the media," says Hruby. It is therefore necessary to explain to them that a prosthetic hand is not some fantastic thing. The psychosocial assessment helps to identify early on those patients who have unrealistic expectations, to exclude unsuitable people from the programme and also to be able to offer help with any psychological issues or to work together to develop strategies to overcome these problems."

As well as the psychosocial assessment, the publication in the internationally renowned medical journal *PLOS One* also contains new findings about the positive impact of bionic reconstruction on body image and quality-of-life for affected patients.

**More information:** Laura Antonia Hruby et al. The Vienna

psychosocial assessment procedure for bionic reconstruction in patients with global brachial plexus injuries, *PLOS ONE* (2018). [DOI: 10.1371/journal.pone.0189592](https://doi.org/10.1371/journal.pone.0189592)

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